ORGANIC PHOTOELECTRONIC DEVICE INCLUDING A PN JUNCTION AND IMAGE SENSOR

CROSS-REFERENCE TO RELATED APPLICATION

This application claims priority to and the benefit of Korean Patent Application No. 10-2014-0111824 filed in the Korean Intellectual Property Office on Aug. 26, 2014 the entire contents of which are incorporated herein by reference.

BACKGROUND

1. Field

Example embodiments relate to an organic photoelectronic device and an image sensor including the same.

2. Description of the Related Art

A photoelectronic device converts light into an electrical signal using photoelectronic effects, and may include a photodiode and/or a phototransistor. The photoelectronic device may be applied to an image sensor, a solar cell and/or an organic light emitting diode.

An image sensor including a photodiode requires relatively high resolution and thus a relatively small pixel. At present, a silicon photodiode is widely used, but the silicon photodiode has a problem of deteriorated sensitivity and has a relatively small absorption area due to relatively small pixels. Accordingly, an organic material that is capable of replacing silicon has been researched.

The organic material has a relatively high extinction coefficient and selectively absorbs light in a particular wavelength region depending on a molecular structure, and thus may simultaneously replace a photodiode and a color filter and resultantly improve sensitivity and contribute to relatively high integration.

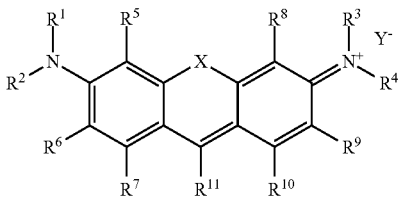
SUMMARY

Example embodiments provide an organic photoelectronic device being capable of heightening wavelength selectivity due to improved light absorption characteristics in a thin film state and decreasing a crosstalk between each pixel.

Example embodiments also provide an image sensor including the organic photoelectronic device.

According to example embodiments, an organic photoelectronic device includes a first electrode and a second electrode facing each other, and an active layer between the first electrode and the second electrode, the active layer including a heterojunction of a p-type semiconductor and an n-type semiconductor, the p-type semiconductor including a compound represented by the following Chemical Formula 1.

[Chemical Formula 1]



In the Chemical Formula 1,

X is one of oxygen (—O—) and sulfur (—S—),

each of R^1 to R^{11} are independently one of hydrogen, a substituted or unsubstituted C_1 to C_{30} alkyl group, a substituted or unsubstituted C_1 to C_{30} alkoxy group, a substituted or unsubstituted C_6 to C_{30} aryl group, a substituted or unsubstituted C_3 to C_{30} heteroaryl group, and a combination thereof, and

Y^- is a halogen ion.

Each of the R^1 to R^4 may be independently one of hydrogen, a substituted or unsubstituted C_1 to C_{30} alkyl group, and a combination thereof.

The R^{11} may be a group derived from one of a substituted or unsubstituted benzene, naphthalene, anthracene, biphenyl, and a combination thereof.

The R^{11} may be a —COOR' group substituting at least one hydrogen. The R' is one of hydrogen, a substituted or unsubstituted C_1 to C_{30} alkyl group, and a combination thereof.

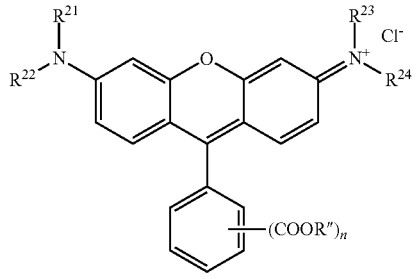
At least one of the R^5 to R^{11} may be one of a substituted or unsubstituted C_1 to C_{30} alkoxy group and a substituted or unsubstituted C_1 to C_{30} alkyl group.

The X may be oxygen (—O—), and the Y^- is a chloride ion ($—Cl^-$).

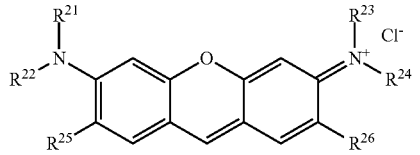
The compound represented by the Chemical Formula 1 may have a maximum absorption wavelength of 500 to 600 nm in a visible ray region.

The p-type semiconductor may include a compound represented by the following Chemical Formula 1a, Chemical Formula 1b, or Chemical Formula 1c.

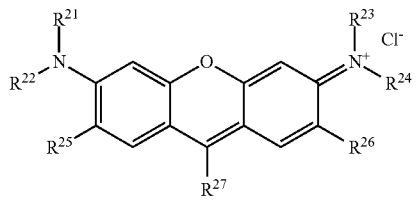
[Chemical Formula 1a]



[Chemical Formula 1b]



[Chemical Formula 1c]



In the Chemical Formulae 1a to 1c,

each of R^{21} to R^{24} are independently one of hydrogen, a substituted or unsubstituted C_1 to C_{30} alkyl group, and a combination thereof,